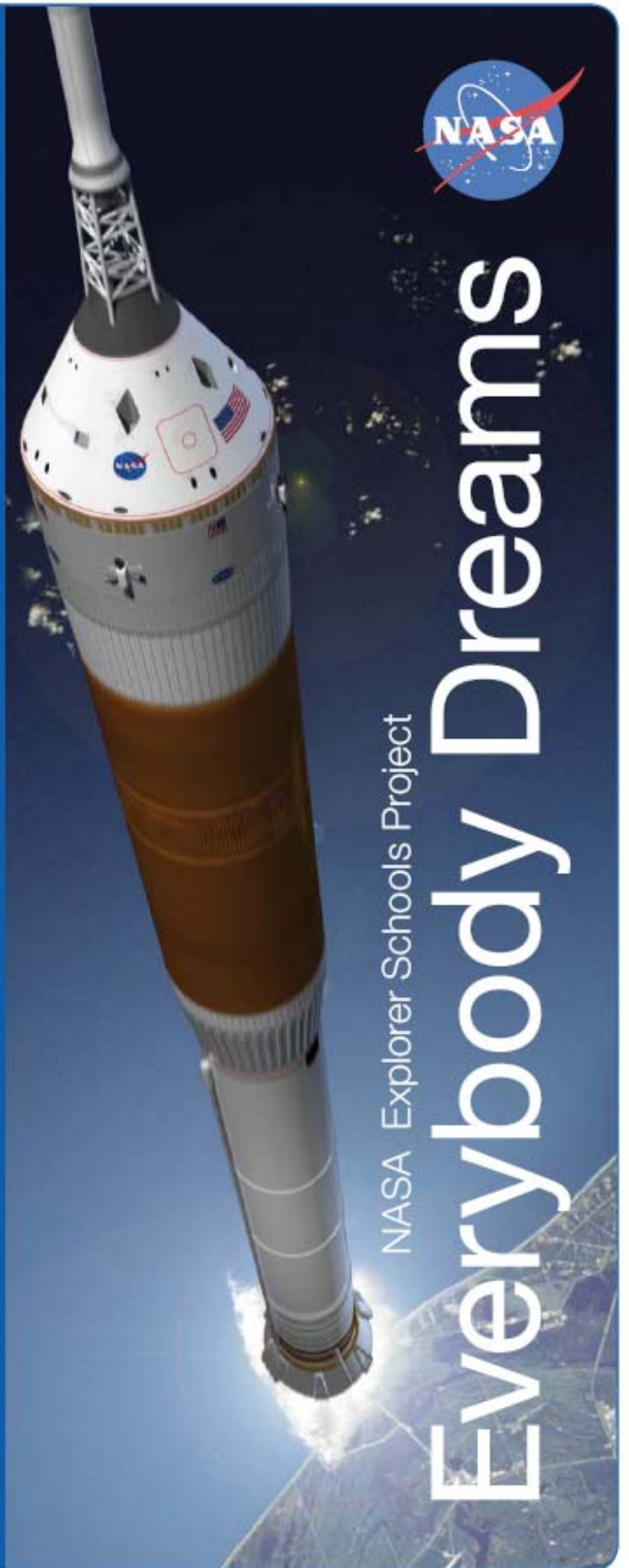


National Aeronautics and Space Administration



NASA Explorer Schools Project

# Everybody Dreams







# Preparing A New Generation



# NASA Explorer Schools

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Dreams of growing crops on the moon



*NASA has a vested interest in making sure that the students of today are qualified to serve as the scientists and engineers of tomorrow.*

*NES provides content and technology tools, helping teachers make the instruction of science and mathematics education more relevant and accessible.*

## Learning Comes to Life

NASA Explorer Schools provides once in a lifetime opportunities for students and teachers by offering access to technology and resources that are seemingly beyond reach. By combining new technologies with NASA content, lesson plans, and real-world experiments, teachers are able to enhance inquiry-based learning and augment student engagement.

The NES Project supports NASA's education strategy by integrating new frameworks for assets that already exist within the agency. This structure helps to support local education efforts to encourage student involvement in STEM learning and eventually aid in career selection. Typically done with teacher support and training, NES offers direct use of NASA mission data to solve investigative questions posed by students. Multiple efforts are underway to provide educators and students with content-specific activities and investigations for use in any local and state curricula.

Through participation in NES, underserved students from both rural and urban areas are exposed to science and mathematics activities they would not otherwise experience including: simulations, visitors from the field (astronauts, engineers, scientists, and technicians), science-related missions, and videoconferencing with people from NASA Centers. Many of the students in the project have never traveled outside the geographic bounds of their local community. As one teacher notes, "many are students who have never been in an airport before, never been on an airplane - and now they're in the aerospace program."

The hands-on, inquiry-based learning model incorporated by the NASA Explorer School Project is critical to developing the skills necessary for America's future workforce. This "exploratory" and "inquisitive" approach to learning helps to motivate and excite students, and improve information retention and critical-analysis capabilities. Creativity and innovation skills are also honed in this model as students use hypotheses and experiments to advance their conceptual understanding of science and mathematics subject areas.



NASA’s approach of targeting underrepresented communities with the NES Project is particularly vital “...because there are students there that can be inspired to decide to major in science,” according to Carolyn Bushman, NES Teamlead at Wendover High School in Wendover, Utah. “My students live 1.5 hours from any major city. They often do not go to college and work in the casinos from the age of 13. Since becoming a NASA Explorer School, I have students talking about someday working for NASA. My students felt that NASA was just for the rich but they now know that they can be a part of NASA.” The students being reached by the NASA Explorer School Project would otherwise not consider themselves part of the future pipeline of scientists, engineers, technical specialists, and mathematicians in American society.

Ms. Bushman further notes that, “these underrepresented communities have a wealth of potential that needs to be hatched. It is an incredible experience to see the windows open and the excitement when a large goal is reached and students strive to accomplish things they never dreamed they could.”

Teachers at NES schools experience major shifts in student behavior including: increased motivation, improved attendance, greater engagement, and heightened excitement. Schools also witness a decrease in the number of disciplinary issues. The NASA content leaves students eager to learn and teachers excited to teach.

## NES Project Model

The NES team-based model requires collaboration between educators and administrators at the local level to achieve sustained professional development over a three-year period. Each team develops a customized approach for their school - working as a team with their assigned NASA Center to assess needs and develop a plan for fulfilling those needs.

An initial assessment collects information about needs in the areas of content and resources. With support from education specialists from ten NASA Centers, each NES-NASA team creates a project direction at the first summer workshop and develops a plan for follow-on support. Teams of educators and administrators author customized implementation plans to meet local mathematics and science education needs. Sustained professional development continues through video conferencing, attendance at professional conferences, and on-site opportunities. Teacher training focuses on instructional techniques and technology tools that support investigative learning using NASA content. NES Teams also create a sustainability plan to cultivate on-going support for the projects initiated by NES partnership.

## NES Team Framework

### Needs Assessment

Identifies specific content and resource needs in the areas of mathematics, science, and technology

### e-folio

Documents team activities with descriptions, pictures, video, and supporting documents.

### Implementation Plan

Details school’s activity timeline accomplished through NES

### Technology Plan

Outlines purchase plans for technology grant money - providing guidance for supportive in-service and the development of new technology applications within NASA context.

### Sustainability Plan

Provides a roadmap for continuing the effort after NASA funding ceases. The plan is developed in cooperation with state coalitions at the end of Year 2 of the partnership.



# Using Technology to Enhance Learning

*“Without NES funding it would be difficult to add all the technology components that we would like. There is no money for big ticket items.”*

*- Carol Sowers, Science Specialist, Grades K-5, Gainsville Elementary School, Gainsville, Georgia*



Participation in the NES Project allows schools to enhance existing technology capacities in major ways. Schools benefit from grant funding to purchase computer equipment (e.g., laptop computers and LCD projectors), multimedia production equipment (e.g., digital cameras and still cameras), scientific technology (e.g., telescopes, lab equipment, and probe ware), and personal technology tools.

NES Teams are grateful for the flexibility to purchase items necessary to enhance their plan. Many schools start by acquiring new equipment that is long overdue - like calculators for every student. Schools also expand their sights with PDAs (personal digital assistant), video conferencing equipment, robotics equipment, and global positioning devices. These tools augment

hands-on experiments and applied research exercises and enable schools to better integrate technologies into instruction.

The Circle of Nations School (CNS) in Wahpeton, North Dakota hosted a Parent's Night with activities including thirteen student-led presentations on technology use within the classroom. Karie Trupka, a 7-8 grade mathematics teacher at the school explains that, "community members, school board members, students, and teachers came to the school to share in the excitement of learning about what CNS has to offer. Students gathered in the courtyard to view the passing of the International Space Station and used the school's telescope." The two-time, North Dakota State Chess Champions brought out the laptops and showed how tutorials increase their knowledge of the sport. The gifted and talented art students used video equipment to show the art of movie making and the science wizards demonstrated how to find a place using the Global Positioning Satellite (GPS) units.

Without NES funding, many schools would be unable to obtain technology components they need. Carolyn Bushman, NES team lead, at Wendover High School in Wendover, Utah reported that, "NES funding helped my school get much needed technology so that we can bring the world and its experiences to my students. In my school the math and science departments are given \$125 a year for supplies!" With NES funding, the school purchased Vernier probes (to allow for collecting and analyzing real-life data) and four 32-inch TV's (for viewing internet examples). "These help students see the real life applications and we have tools to demonstrate when we would never have been able to otherwise," observes Bushman.

Dreams of eating lunch in space





# Engaging Students

*The design of the NES Project allows for immersive experiences with NASA missions, facilities, and personnel. Students lead engaging and interactive investigations – exploring the role that science plays in their daily lives and then extrapolating that experience into the realm of career choices and future lifestyles.*

*Surveys and evaluations of the NES Project consistently point to the Project’s significant impact on students through hands-on, inquiry-based learning.*

## NES Sparks Interest

Students in NES schools are affected by the Project in a variety of ways. For example, by participating in a Reduced Gravity Flight Experiment, students are challenged to come up with an initial idea or problem. They develop an experiment and do research to determine the best materials to use in evaluating their hypothesis. Students then get the opportunity to review the data findings after their teacher conducts the experiment onboard NASA’s micro-gravity jet. This analytical framework has far reaching effects. “Thinking like an engineer has helped me do all my homework and classes,” states a 5th grade student at Crossroads Elementary Science in St. Paul, Minnesota.

Students have been given opportunities to create and modify experiments, interpret data, and present their findings to peers at the annual NES Student Symposium. Teachers are provided with investigations to engage their students in real scientific projects. One example of success was described by Anna Mika from Cumberland Middle School in Wisconsin who involved her students in the Student Experiment Module Balloon experiment. She stated that “Students came to school on their days off to develop an experiment, present it to their classmates for replication purposes, and create a presentation for NASA officials. Students also produced, downloaded and edited video of their work and travels and broadcasted it to all seventh and eighth grade students and staff as well as the school board.”

## Improving Student Knowledge

Reports from participating schools show that NES has played a significant role in improving student performance. Reports from teachers and administrators show increased student performance on homework, school tests, and even state achievement exams.

After determining that student performance in the areas of math, science, and technology needed to be improved at Bay Waveland Middle School in Bay Saint Louis, Mississippi, the NES Team focused on engaging students with more challenging learning opportunities. Pre and post tests indicated that the new teaching methods were extremely effective in sparking student interest and delivering content. “While we knew we were on the right track, our building level evaluations took a backseat

when our test scores came in,” notes one of the NES team members. “Our school scores had increased from a level 3 (on a scale from 1 to 5) to a level 5. We had earned the distinction of being an exemplary school. When we further evaluated the scores, we recognized the impact of NES participation in significant ways.”

Drastic improvements were also achieved at Bolivar Elementary School in Bolivar, Tennessee. Team leader and 5th grade science teacher Helen Henning related that poor math and reading scores on 2002-03 standardized test placed the school on “the list” for poor performance. At the end of their first year as an NES School (2003-04), Bolivar Elementary was removed from “the list.” The

Facilitator at the school. “With the help of NASA and the incredible resources, our school enrollment has ballooned from 300+ to 500+.” The school is now second in the state in math within their demographic profile and in the top ten in reading. “We were STUNNED!” exclaims Ms. Lowrey. “This success is certainly due largely in part to the NASA assistance we received.”

*“I like that NASA believes we really can... and now I know it too!”*

*- Student at Crossroads Elementary Science in Saint Paul, Minnesota*



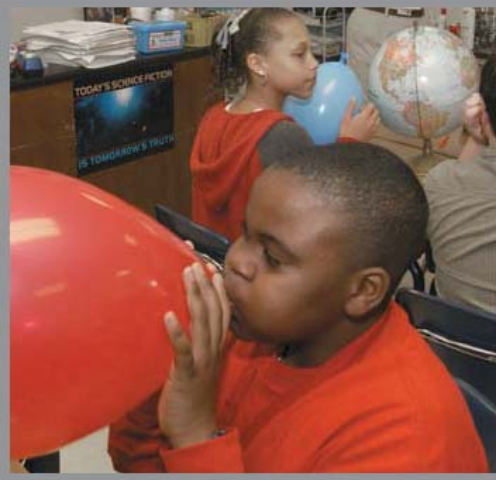
school continued to do well the following year and is now a school in good standing. Ms. Henning explained the role NES played in these improvements noting, “we do feel that the NES Project gave us the energy to do the extra work involved in bringing up scores. We are now able to use calculators on the tests since we got them with NES funds, and even though there is not a lot for them to calculate, it increases the students’ confidence and that goes a long way to improving scores.”

Langston Magnet School in Hot Springs, Arkansas also experienced heightened performance in test scores and state-wide rankings. When the school was formed in 2001 it was seen as a “behavior school” where “problem kids” were sent. “Test scores were in the bottom one-third (of the state) and we were struggling to keep alive,” notes Bernice Lowrey, Science

## NES Encourages Teamwork

NES is built on a system of teams and cooperation. Carol Clark, a 5th grade teacher at Faulconer-Chapman in Sheridan, Oregon taught a unit on Mars, part of which incorporated Mars-bound material. Students were assigned to groups of four or five and given student booklets to track their progress as they planned their mission to Mars. “When students showed up to class without their booklets, I reminded them that NASA personnel could not show up unprepared,” explains Ms. Clark. A team was not allowed to participate when one member did not come prepared. “I showed them that when one person on a team failed to do their part, it slowed the whole mission down. It worked. Everyone showed up with their books every day.”





## Students are Excited

Teachers observe students' newfound interest in science and mathematics. "NES has brought a new excitement back into the classroom. With all the support and materials available from NASA, I have been able to more effectively integrate science, technology, engineering, and mathematics into all the curricular areas, especially language arts," notes Charlotte Groty, a 4th grade teacher at North Ridge Elementary in Moreno Valley, California.

A fellow teacher at North Ridge, Beth Sandez, supports this observation explaining, "I've used the NASA activities and materials to excite and motivate my students as they learn the core curriculum. Math has meaning when you're averaging data collected from a NASA GAVRT mission. Reading about the life cycles of ants for a planned rocket flight experiment doesn't seem like reading even though the information is at a higher reading level than the students' grade level. I've been able to teach a more meaningful curriculum by using NES materials."

As one student at Matthew J. Kuss Middle School in Fall River, Massachusetts notes, "It is not worth the risk of losing this opportunity with NASA to fool around in class or let my grades slip... I'm glad to have NASA behind me now to show me the right path."



## Students are Empowered

Lynn Kollar, a 5th grade teacher at North Ridge Magnet School in Moreno Valley, California notes that "since becoming an NES teacher, I have found it easier to keep the students interested in their STEM coursework. I have been able to bring so many real-life examples into my classroom as I have learned more about NASA activities and resources. One of the exciting things we did this year was track hurricanes through NASA websites. This really kept the kids interested in their weather lessons, and it gave them new ideas of how NASA satellites help us forecast weather. Throughout the year, the students learned that NASA was more than just astronauts."

Students participating in the NES Project feel like "celebrities" when visiting NASA Space Centers and seek more and more information about NASA whenever they meet with scientists or astronauts. One teacher said these opportunities "changed the kids' lives" in terms of confidence and self-esteem building.



## Students are Engaged

By linking science and mathematics lessons to real-world activities, teachers are able to achieve a combined goal of subject-matter-relevance and student involvement.

Jessica Sylvia, a 6th grade teacher at Matthew J. Kuss Middle School in Fall River, Massachusetts, comments that "the NES Project has helped me to reach a broader scope of students, even those not previously interested in science. It has helped me grow as an educator by learning how important and relevant the engagement of each individual is."



## NES Changes Student Attitudes and Habits: ( \*data from the Center for Educational Technologies )

60%	will now talk to their friends about STEM-G
78%	will now talk to their families about STEM-G
67%	will now talk to their classmates about STEM-G
61%	will now attend STEM-G events when not in school
87%	interested in learning more about STEM-G careers
69%	will now read books about STEM-G
64%	will now visit websites about STEM-G
74%	will now visit places featuring science

## “Lost” Students are Found

Teachers at NASA Explorer Schools often point to students they feel have been “saved” by participating in the Project. Lynn Kollar, 5th Grade Teacher at North Ridge Magnet School in Moreno Valley, California shares her experience with one particular student. “Michael, a fifth grader, entered our school this year. He was an incredibly bright kid, and was aware of his ability level. However, Michael was unable to finish work, express orally what was on his mind, or relate to his peers positively. This made life very miserable for him, as he was frustrated on a daily basis by his inability to perform to his capabilities or to make friends.”

Ms. Kollar explains that “the opportunities provided to Michael because we are a NASA Explorer School helped to give him the challenges he needed and the opportunities to develop his interpersonal skills, while he explored new scientific avenues. Michael has gone on to middle school excited about the chance to study more science and confident in his ability to do well.”

Teachers at NES schools often cite examples of troubled students. One child was put in charge of the Operation Montserrat e-Mission and on the day of the interview, scored the highest out of the class on the algebra test. Another example occurred at a school where a struggling student was not very interested in school but wanted to be part of the NASA Club. An agreement was reached whereby the student promised to come to school and complete his work in exchange for the opportunity to participate in the Club. “This would have been a student we would have lost

exhibiting difficult behavioral problems was placed in charge of the technology for the Wallops Island rocket launch, he performed remarkably. “He’s doing very well in high school,” notes one of his former teachers. “This is a kid we almost lost.”

Brooke Murders, a 5th Grade teacher at Langston Magnet School in Hot Springs, Arkansas shares a story of a student she met during her first year of teaching. This boy had been retained in third grade and was known throughout the school as a slow learner with behavioral problems. Ms. Murders explains that she “worked with him and implemented many of the activities and learning strategies” given to her by NES team members. He became “a FABULOUS student.” The student was “so excited and interested in the field of aerospace. He always wanted to know and learn more.” He also became a leader in the room, an honor roll student every nine weeks, and was awarded the “Terrific Kid” award for excellent behavior. “I believe his success was brought about because of the resources our school was given through the NES Project,” notes Ms. Murders. This student “exceeded my expectations and his” and has grown into a young man “excited about the venture ahead of him.”

Karen Borders, a teacher at Key Peninsula Middle School in Lakebay, Washington describes the experience of one of her students. The student entered school mid-year and had experienced a rough life. She told Ms. Borders about “couch-surfing” – not having a home and sleeping on the couch of a friend until it was time to move on. She was battling depression and didn’t feel connected to school in any meaningful fashion. She was placed in the NASA Astronomy and Aerospace class and underwent a dramatic change.



“Her attitude toward school and herself is now very positive and she is motivated,” notes Ms. Borders. She has “really opened her eyes and heart to the possibility of college and a career.”

## NES Instills Pride

Participants in NES have observed that the Project has a unique ability to instill pride. Students, teachers, and administra-

the school and the students. All the teachers have NASA school shirts that we all wear on Fridays and it’s pretty cool to see us all as a unified group. We have NASA murals on the walls and in the cafeteria and we use space themes for our school-wide activities. We seem to be more of a cohesive unit instead of autonomous little districts.” A 5th grade student at Crossroads Elementary Science in St. Paul, Minnesota put it simply – “I like telling others we are an NES. I feel important.”

at North Ridge Elementary in Moreno Valley, California notes, “there is a sense of pride in being part of NASA. Staff, students, and families are proud to be a part of our NES school and feel special because of the Project.”

Changes in attitude occur across the Project. Principal Joe Blevins of Phenix City Intermediate School (PCIS) in Phenix City, Alabama explains that “the biggest change at PCIS is not the space murals

*“Anywhere I go I am proud to tell everyone where I teach and what our school is all about.”*

*–Brooke Murders, a 5th grade teacher at Langston Magnet School in Hot Springs, Arkansas*



tors view themselves not as participants in NES, but rather as part of NASA.

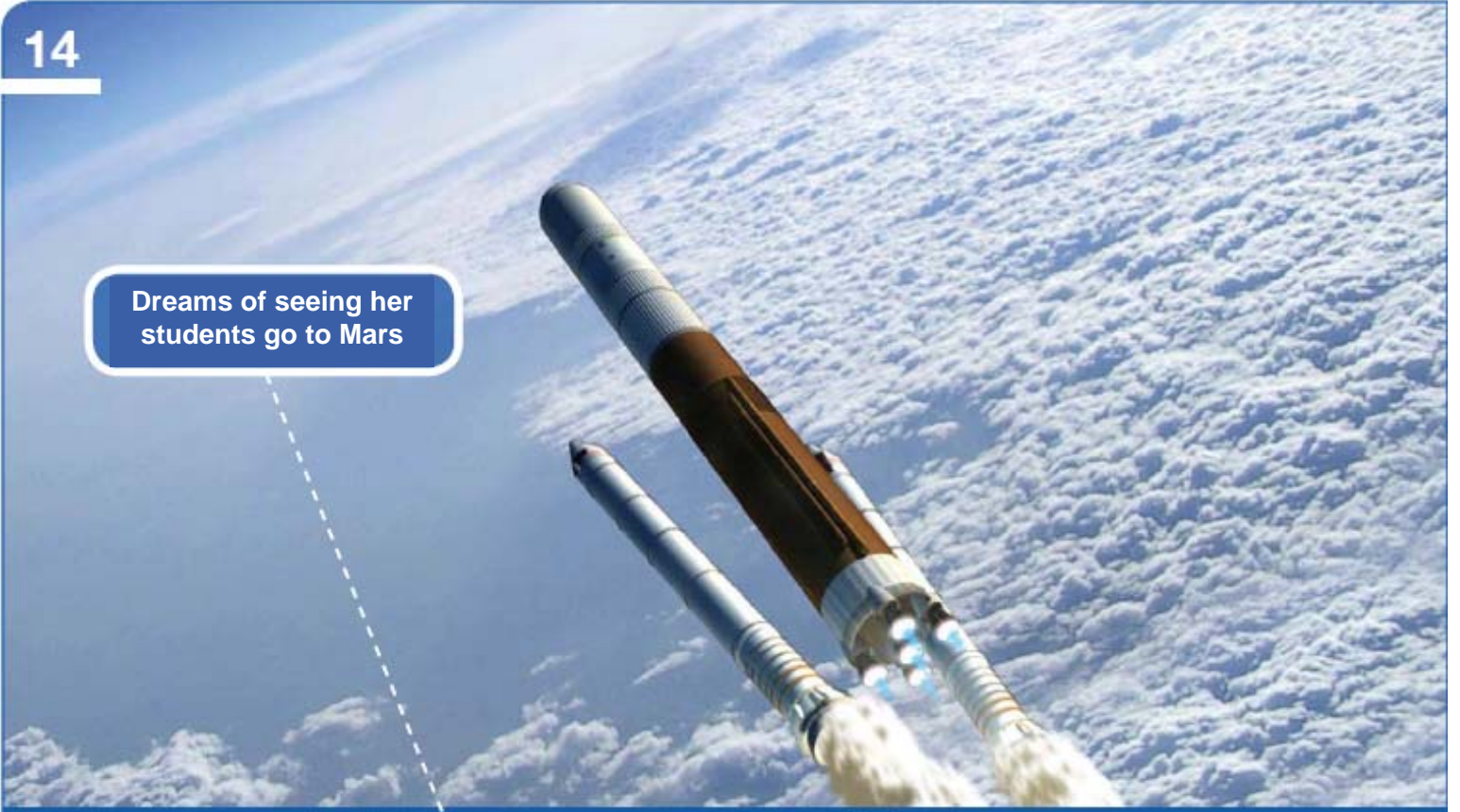
Helen Henning, team leader and 5th grade science teacher at Bolivar Elementary School in Bolivar, Tennessee describes the effect of NES on the entire school system. “Our school has had poor morale in the past. Now it seems that we are prouder of

A member of the staff at Joyce Kilmer Elementary School in Chicago, Illinois explains that following NES selection, “our children began to believe they were special and important and would be needed in the workforce of the future. Our students began to believe that they, too, could also dream and reach for the stars.” Beth Sandez, a 4th grade teacher

on the walls or the technology in the classrooms. The change at PCIS is in our attitude.” The change was evident when a parent came to Principal Blevins’ office to discuss a discipline matter concerning her daughter. After hearing Principal Blevins’ side of the story, the mother turned to her child and said, “You can’t do that junk here! This is a NASA school!”



Dreams of seeing her students go to Mars





*Teachers are eager for professional development opportunities that prepare them for the evolving needs of the classroom environment – yet they often lack the financial support to seek out or attend events to enhance their teaching skills.*

*The NASA Explorer Schools Project strives to address the challenges facing science and mathematics teachers in underserved schools. By doing this, NES works to achieve a dual benefit of improved instruction and a higher quality of education for students.*

## Enhancing the Skills to Teach

NASA attempts to recognize teachers and school administrators for the important contribution they make to the education of America's youth. The Project offers rigorous, career-enhancing, professional development to all participating teachers. By receiving educational and financial support from NASA, teachers are offered increased access to educational resources and professional development opportunities at the local and national level.

Professional development opportunities for teachers and administrators are offered through a variety of channels. Access to NASA websites, astronauts, video-conferencing, subject experts, and field sites, provides educators with curriculum support. Additionally, scholarships are offered to NES educators to attend regional and national workshops and conferences. The quality of resources and the frequency of their availability is a significant improvement over the access to materials the teachers and administrators had prior to becoming an NES participant.

## Empowering Educators

The NES Project provides in-depth training in inquiry-based teaching and collaborative learning techniques. Teachers who have been teaching for ten or even twenty years, repeatedly acknowledge the impact NES has in expanding their instructional capabilities in addition to building their confidence for teaching science and mathematics. "For the rest of my teaching career, I will be able to draw upon this knowledge and these experiences to enhance my lessons. NASA has ensured that I will never teach the same," affirms Terry Willa of Martinsville Middle School in Martinsville, Virginia. NASA must inspire students in all areas of science and mathematics learning. Many teachers report going beyond textbook learning, with several eliminating textbooks altogether.



In-depth learning experiences give teachers the chance to develop new areas of expertise. “Before, I might let my lack of understanding or expertise in certain areas hold me back from participating,” observes Carol Clark, a 5th grade teacher at Faulconer Chapman in Sheridan, Oregon. “Now, I have confidence and know that I can find others to help me and I am ready to tackle any opportunity that comes our way.”

The level of sharing between teachers within a school, as well as new connections between teachers from different schools in the Project, is greatly enhanced by NES. Attending conferences and workshops throughout the country exposes teachers to new ways of teaching fundamental concepts, and networks other teachers, administrators, and NASA experts who can offer guidance and advice in developing lesson plans and creating in-class experiences.

The Project’s impact extends beyond the core NES team, with teachers throughout the school implementing inquiry-based learning techniques and enjoying increased student engagement. The NASA Explorer Schools Project focuses on dynamic best practices in the instruction of science, mathematics, and technology.

## Reasons Why Teachers Like NES:

- 1 Ability to choose the type of workshops they can attend
- 2 Chance to attend events with other colleagues
- 3 Opportunity to meet a variety of scientists and engineers
- 4 Feel like they are treated like professionals at all times
- 5 Learn about NASA career opportunities for students
- 6 Understand NASA’s contribution to “everyday life”
- 7 Improve content knowledge in “cutting edge” areas

## Enhancing the Classroom Experience

Following extensive learning in specific areas, teachers feel more confident in presenting the material to their students – while at the same time being able to better convey its relevance. A fifth grade science teacher in the Project observes, “I am not just teaching the facts but am able to explain why these things are important and how they are used in the world. My resources are up-to-date and include new discoveries that enthuse my students. I am using much more technology than I did before and, more importantly, my students are using it too.”

NES gives teachers opportunities for professional development that are otherwise unattainable. “Our district simply does not have the funds to send teachers to quality training,” notes Helen Henning, a 5th grade science teacher at Bolivar Elementary School in Bolivar, Tennessee. “I have always paid my own way to the NSTA conventions. Now, not only can I go, but my fellow team teachers have the opportunity to receive this training also... There is no doubt that we now have resources that we never had or certainly were not aware of before NES.”

## Re-Energizing Veteran Teachers

NES is able to excite educators and remind them why they became teachers. Carol Sowers, Science Specialist for Grades K-5 at Gainesville Elementary in Gainesville, Georgia reflects, “as a 30-year veteran of teaching, I felt that I was becoming bored. Through the professional development that NES has offered I now have new skills to freshen my classroom. The activities I have learned are just as engaging to me as they are to my students. You can teach an old teacher new tricks.”



# Extreme Learning in Extreme Weather

*“For the rest of my teaching career, I will be able to draw upon this knowledge and these experiences to enhance my lessons.”*

*- Terry Wiita, Martinsville Middle School, Martinsville, Virginia*

In mid-winter each year, teachers gather in a cold, harsh environment to perform non polar investigations of ice, snow, and cold. The workshop provides teachers with the opportunity to live and work alongside snow and ice scientists from NASA in an environment that allows them to experience first hand the harsh conditions associated with a winter climate as they sleep in tents and bear temperatures that drop to  $-17^{\circ}\text{C}$ .

The Winter’s Story workshop applies an inquiry-based learning model to the subject of the water cycle – giving educators the chance to study ice and snow as a component piece of the system. Teachers don extreme temperature snow gear and brave subfreezing weather conditions to learn more about the role ice plays on Earth and in the cosmos.

Ice is one of the most widespread, intriguing, and familiar compounds in the solar system and is found everywhere from the frozen lakes of Minnesota to the frozen oceans of Jupiter’s moon Europa. As a subject matter, ice provides a unique opportunity to study a phenomenon that occurs throughout the universe without ever leaving Earth.

Teachers learn about meteorologic conditions of winter, track winter storms, and study ice on other planets. They investigate how winter weather affects wildlife and bring back knowledge to their students for local investigations and on-line recording through the Student Observation Network.

After their snow and ice experiments are complete, the teachers develop an innovative science curriculum in accordance with the National Science Education Standards. This curriculum is



then made available to all of the teachers in the NES Project. Not only does this give teachers hands on, personal experience — but it also allows them to improve their teaching skills.

“For the rest of my teaching career, I will be able to draw upon this knowledge and these experiences to enhance my lessons,” affirms Terry Wiita of Martinsville Middle School in Martinsville, Virginia.

“It was awesome to get out on the lakes and turn the drill to get a core to measure how deep the ice was. I was so excited to apply what I learned that one evening I went out in a group and we built a 15 foot dendrite,” exclaims Carolyn Bushman, the NES Team Lead at Wendover High School, Wendover, Utah.



Dreams of piloting the Crew Exploration Vehicle





# Connecting Communities

*The NES designation automatically brings a new level of recognition to students, teachers, and local communities.*

*Almost all NES schools report dramatic increases in family involvement due to NES.*

*Community participation also increases as citizens take great pride in NASA's visible presence and investment at the local level.*

## Family Engagement

NES is a great unifier, bringing people together around the collective interest of educating students with the skills needed to succeed in the future. NES provides strategies, materials, and resources for families to support their children's science and mathematics education. NES is developing a trained network of local family coordinators who work with NASA education experts to implement local family events.

A 5th grade teacher at Battle Academy in Tennessee, Debbie Rosenow, describes how NES engaged parents. "One of our greatest successes this year was our Family Science Night with NASA. Generally we have around 50-60 people attend our PTA meetings – on a GOOD night! For Family Science Night with NASA we had over 400 people in attendance. The most rewarding comments came at the end of the night when our Aerospace Education Services Program specialists (AESP) and facilitators commented on the fathers who attended and were involved in the activities. They went on to say that you just don't see that any more! Our staff was thrilled to have such a generous turnout!"

Every new NES School organizes a Launch Picnic or Blast Off Night to introduce the local community to the NES Project and its unique offerings. This event is followed with outreach efforts like Lunar Challenge, Star Parties, Family Rocket Workshops, and Family Math Nights. These activities combine celebration and learning into a memorable experience for all who attend. In addition, monthly newsletters provide updates to families about current NASA initiatives and NES activities.

## Building School Recognition

NES status is a newsworthy story that captures the interest of the public regardless of age or background. In a day when media coverage of schools is often negative, NES provides an inspirational and positive example of classroom engagement. NES schools are encouraged to leverage their designation through outreach to local government, community officials, and surrounding businesses.

Beth Sandez, a 4th grade teacher at North Ridge Elementary in Moreno Valley, California notes that the NES Team, the principal, and the school’s Public Affairs office were instrumental in getting the news out to the community. “North Ridge Elementary’s NES activities have been featured in The Press Enterprise newspaper (circulation 190,000) at least seven times since becoming a NASA Explorer School! Our Blast Off activities were attended by many

## Community Involvement

Many NES schools are located in the some of the poorest urban and rural communities in the United States. In turn, NES serves as a beacon of hope - an unprecedented source of life changing opportunities for participants. Many of the students and communities served by NES feel “forgotten” and overlooked by an already stretched public education system. “There is no doubt that our community is impressed that an organization like NASA actually cares about them,” observes one teacher.

NASA’s brand and the associated prestige is often displayed prominently throughout NES schools. Students, teachers, and parents proudly wear their NASA Explorer School shirts, with schools often transforming cafeterias, classrooms, and computer-labs with murals of space and earth science images. “The NES project is in

### Community Engagement Continues to Grow Through NES ( \*data from the Center for Educational Technologies )

2003		2004	
<b>96%</b>	of schools reported family involvement	<b>97%</b>	of schools reported family involvement
<b>41%</b>	of schools reported engaging in local collaborations	<b>66%</b>	of schools reported engaging in local collaborations,
<b>31%</b>	of teams doing distance learning	<b>37%</b>	of schools reported distance learning collaborations
<b>22%</b>	reported grant-writing and procurement activities	<b>21%</b>	reported grant-writing and procurement activities
<b>22%</b>	of schools reported the involvement of guest speakers	<b>55%</b>	of schools reported the involvement of guest speakers
<b>6%</b>	reported involvement with local business persons	<b>21%</b>	reported involvement with local business persons

dignitaries such as our State Assemblyman, State Senator, a staff member from our representative in the House of Representatives, school district office personnel, radio telescope staff, Museum officials, NASA Center personnel, and staff from the University of Riverside,” notes Ms. Sandez. “Workers at the UPS office recognized our Flying Ant Project from the newspaper articles and promised to deliver the Student Experiment Module safely to Wallops Flight Facility, 3,000 miles away. I included our designation as an NES when applying for an A+ for Energy Grant, which I believe helped convince the readers to fund our application!” exclaims Ms. Sandez. Two of the school’s team members were named “Teachers of the Year” by the local school district and the

the business of generating hope for our future,” states Jay Blank, from Edwards Middle School in Edwards, California. The effect is contagious as witnessed by Principal Joe Blevins, of Phenix City Intermediate School (PCIS) in Phenix City, Alabama. “The enthusiasm for learning spread into the community. By leveraging the NASA name, PCIS parlayed the NASA grant into more than \$100,000 in school improvements and resources, including video-conferencing equipment.”





## School-Wide Impact

The contribution of NES often travels across an entire school, facilitating cooperation among different grade levels and between both students and teachers. This contact strengthens the educational environment and improves how teachers work together in cross-departmental teams. Kate Deater, Dean of Students and Science Instructor at Greencastle-Antrim School District in Greencastle, Pennsylvania recounts, “The NES Project has helped our K-12 faculty and staff work together on initiatives and projects that benefit students at all levels. Our Project was focused on students in grades 8 and 9, but quickly grew to include other grade levels in our middle and high schools and also some classrooms at our elementary school.”

Access to NASA resources and personnel is a key element in sparking interest and excitement in an entire school community. “Our students are learning to tackle projects with a spirit of exploration and cooperation just like NASA scientists do!” exclaims Ms. Deater.



## Cross-School Exchange

Uniquely, the Project encourages NES designated schools to collaborate with other NES schools in their region. The community of exchange and learning increases the impact that each respective school can have on its own.

“Our NES team was supported in its efforts by another NES team located about fifty miles away. We reciprocated by helping with their Blast Off Night. We’re in regular contact with at least three other NES schools - some out of our region. It’s been great to have support and contact with other NES schools, something that wasn’t the case before the Project,” explains Beth Sandez, a 4th grade teacher at North Ridge Elementary in Moreno Valley, California.

The Project delivers a shared experience that brings people together. Schools that normally would not have the opportunity to connect and collaborate are able to come together through the powerful unifying umbrella of NES.



## Enlisting New Schools

It’s not unusual for NES designated schools to receive repeated inquiries from surrounding schools eager to join the Project.

Since its creation, NES has experienced growing demand for participation in the NES Project spreading across school districts nationwide.

Kate Deater of Greencastle-Antrim School District in Greencastle, Pennsylvania explains, “we’re excited that neighboring school districts (in Pennsylvania and Maryland) have expressed an interest in the Project – they want to see what we’re doing, and how NASA’s Education programs can help the faculty and students in their districts achieve more in science.”



Dreams of using a bigger lens





# Inspiring Hope

*Serving a predominantly minority audience, NASA Explorer Schools provides vision and inspiration to impressionable young people.*

*NES connects NASA to communities at a personal level - allowing students, teachers, parents, administrators, and the local community to experience and interact with NASA outside the newspaper headlines.*

*Every community with a NASA Explorer School is transformed, strengthening a sense of goodwill and pride for one of the United States' greatest institutions.*

## Unprecedented Opportunities

NES expands horizons - opening young minds to the possibilities of what the future holds. NES strives to make the resources, experiences, and tools necessary for effective science and mathematics education available to schools nationwide.

The NES Project links participants to resources that are normally beyond reach in the public school system. This direct contact plays an integral part in impacting individual students and entire school communities.

Aerospace Education Services Program (AESP) specialists, assigned to NASA Centers, are available nationwide to provide on-site workshops for NES schools. The specialists assist NES teams in implementing their strategic plans through onsite activities and summer workshops. NES Coordinators serve as communication and information hubs at each NASA Center assuring that NES teams are aware of Project opportunities.

## Serving the Hardest to Reach

The NASA Explorer Schools Project works to close the achievement gap among diverse populations. NES is strategic in both geographic reach and focus – serving schools in all fifty states, the District of Columbia, Puerto Rico, and the Virgin Islands. The Project represents both urban and rural communities where untapped talent waits for the right opportunity.

“Many of our students and families have been in a rut and NES helps them see there are many possibilities. It gives them a chance to be a part of the job market because they have a strong STEM background. It gives hope to our students, families, and community,” notes Marie Scott, a 5th grade teacher at Faulconer-Chapman in Sheridan, Oregon.



## High Minority Populations

**86%** 2006 NES Schools

**75%** 2004 NES Schools

**76%** 2003 NES Schools

## Low Income Populations

**100%** 2006 NES Schools

**82%** 2004 NES Schools

**76%** 2003 NES Schools

## Diversity-Oriented Efforts

NES makes extensive use of targeted classroom strategies proven to result in higher student growth and achievement in diverse populations. Ad Hoc committees provide guidance in the development and incorporation of culturally relevant strategies applied in the Project.

A system of liaisons provides frequent consultations and better delivery of services to underserved populations. Liaisons are in place for Native American, Alaskan native, and Hawaiian populations. The Urban and Rural Community Enrichment Program (UR-CEP) provided guidance in working with urban African American and Hispanic communities.

NES is a powerful force in breaking down barriers to access and opportunities. “Underrepresented schools need someone in their corner. NASA is qualified to fill that role... [Parents] see that their children will have a chance and an opportunity that they never had...” notes Carol Clark, a 5th grade teacher at Faulconer-Chapman School in Sheridan, Oregon. Another teacher, Charlotte Groty, at North Ridge Elementary in Moreno Valley, California explains that being an NES school “brought our student’s opportunities that never would have been possible. These students have learned that dreams do come true and hard work can be fun. Our students are learning of the many careers that are possible and what it takes to achieve these. They are learning the positives of working together, learning together, and coming to a successful conclusion. They are beginning to take what they learn and use it in real life situations today and in the future.”

## Digital Access for All

NASA’s Digital Learning Network (DLN) expands the reach of the Project and enhances the capability to deliver unique content. The DLN offers videoconferencing at no charge - linking students and educators with NASA experts. The network provides interactive educational experiences to students and educators throughout the country in the NES system.

The DLN places the knowledge and expertise of NASA scientists, engineers, and researchers directly into the classroom. Through the DLN, learners at all levels have the opportunity to interact directly with experts, often from their workplace, to gain a new appreciation for the importance of science, technology, engineering, and mathematics education.

Anna Mika, a 7th grade science and math teacher at Cumberland Middle School in Cumberland, Wisconsin explains how DLN allowed them to leverage NES involvement. “We are a rural school that has little opportunity for interaction with scientists, researchers, and astronauts. This year, we had the opportunity to do all of this and more.” Ms. Mika notes that videoconferencing allows students and teachers to connect with people all over the country to assist in the development of experiment ideas. “We have been able to add to our repertoire of resources through the Digital Learning Network. Students have been given opportunities to participate in e-Missions as well as videoconferences with researchers and scientists. These opportunities would not have been available to us without NES funding.”



## Sustaining a Future for NES

The NES Partnerships for Sustainability program is managed by the National Alliance of State Science and Mathematics Coalitions (NASSMC). The Sustainability program supports the formation and operation of partnerships between NASA Explorer Schools and state coalitions of business leaders, state government officials, and state education officials. The purpose of these partnerships is to build a sustainable role for NASA Explorer Schools in the state-based efforts to improve mathematics, science, and technology education. The project strives to create funding partnerships to take schools beyond the initial three-year funding period envisioned by NES. The program plans to award additional funding in subsequent years to further promote activities between the schools and the state-based coalitions.

The NES Project develops multiple avenues in order to leverage NASA and partner assistance in the implementation of NES team strategic plans. Space Grant consortia, Aerospace Education Services Program Specialists, NASA Mission Directorates, and com-

and inquiry-based curriculum for bringing the subjects of science and mathematics to life.

Active learning and engaging NASA investigations promote student interest. Teachers use NASA content to encourage students to explore future careers in mathematics and science.

The NES Project is designed to respond to the need to increase the number of students entering science and technical careers through the professional development of educators, investigation opportunities for students, and a comprehensive family involvement strategy to enlist family support of STEM education and promote the awareness of STEM careers. NES provides a catalytic effect on many of the schools it serves.

As Kate Deater, Dean of Students and Science Instructor for grades 9-12 at Greencastle-Antrim School District, Greencastle, PA explains, “If there is a niche that a teacher is trying to fill in their curriculum, there is a NASA application that can help.” NES participants often witness an impact on their entire school

*“Much of the demographic NES serves does not believe that they can impact their community in a positive way. By exposing them to this Project, they better understand there is a place for them at NASA.”*

*- Jessica Sylvia, 6th grade teacher, Matthew J. Kuss Middle School, Fall River, MA*

mercial and professional partners provide support to schools in their states and regions. Increased access to networks and funding sources resulted in over \$107,000 in additional funding for Carol Elementary School in Miami, Florida and \$425,000 in grants for Sioux Central Community School District in northwest Iowa.

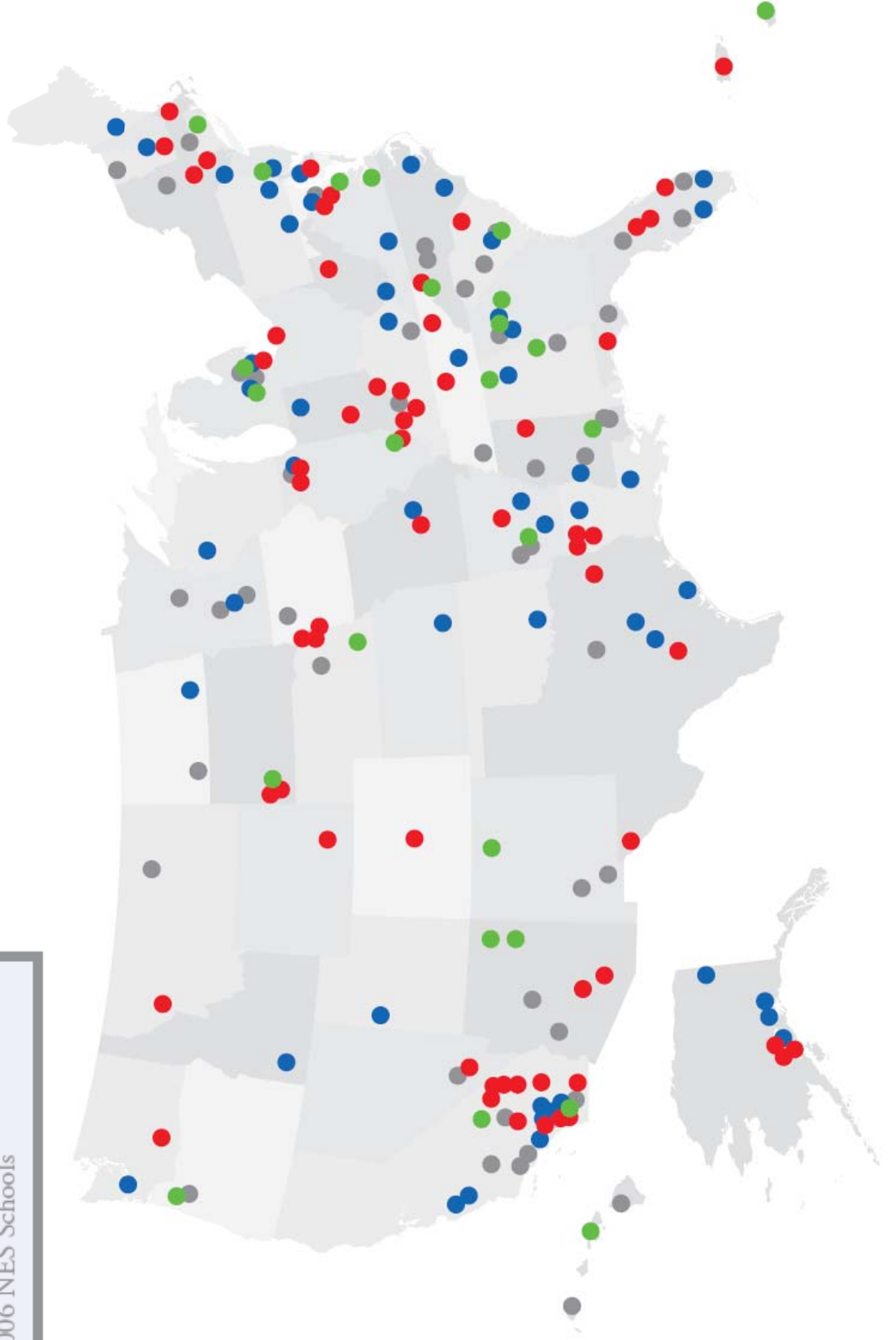
## A National Science Education Model

NES has the potential to become a national model for science education. In an age when teachers and schools struggle to make learning relevant, NES provides a launchpad of content, experiences

system. As Ms. Deter testifies, “the NES Project in our district has gone beyond the boundaries of the middle and high school and now includes all 4th grade classrooms and other classrooms in our elementary school.”

The impact of NES and its documented success offers great promise. NASA’s leadership in the classroom is making a lasting contribution to science and mathematics education. At NASA Explorer Schools around the country, the next generation of scientists, mathematicians, and engineers are encouraged to pursue their dreams.

# NES Distribution





# Key Project Outcomes

1

increase student interest and participation in science, technology, engineering, mathematics, and geography

2

increase student knowledge about careers in science, technology, engineering, mathematics, and geography

3

increase student ability to apply science, technology, engineering, mathematics, and geography concepts and skills in meaningful ways

4

increase the active participation and professional growth of educators in science, technology, engineering, mathematics, and geography

5

increase the academic assistance for and technology use by educators in schools with high populations of underserved students

6

increase family involvement in children's learning

National Aeronautics and Space Administration

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